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ABSTRACT

This booklet provides summaries of discussions presented at a forum designed to aid persons new to the job market in selecting prospective employers and determining career goals. Salary ranges, employment opportunities and trends, hiring practices and policies, and job qualifications are among the areas addressed related to employment in: (1) petroleum exploration industries; (2) the mining industry; (3) the federal government; (4) state and local governments; (5) the academic disciplines; and (6) geoscience consulting firms. Tips for successful interviews and on writing resumes are included. (JN)

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REVIEW OF PRESENTATIONS AT GSA BRIEFING ON

Future Employment Opportunities in the Geological Sciences

U.S. DEPARTMENT OF EDUCATION
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INDIANAPOLIS, INDIANA, OCTOBER 31, 1983

SE044372

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Employment opportunities for geologists and geophysicists in petroleum exploration in 1983-84 will be about the same as in 1982, which was down dramatically from 1981. Oil prices, energy consumption, drilling, and seismic activity seem to have stabilized and show signs of strengthening with an improving economic outlook for 1984 and 1985.

Exploration recruitment quotas will be slow to increase again because of recent high hiring rates, continued low attrition and retirement rates, and the pool of experienced explorationists overhanging the market from recent staff reductions and mergers in the petroleum industry. However, competition for high-quality graduate students will still be strong among major petroleum companies in 1984. Most of the best-qualified advanced degree graduates in geology, and particularly in geophysics, should receive a job offer. Salaries will be similar to those offered last year, about $30,000 per year for a master's degree. Be prompt in responding to job offers. Companies will try to hire the best candidates within their restricted recruitment quotas.

Most of those who have a bachelor's degree in geology will find it very difficult to get an attractive, permanent job offer in petroleum exploration. Those of you with good academic credentials, including a sound background in math, physics, chemistry, and computer science (and sufficient financing), should choose a good graduate program and obtain a master's degree. Consider choosing geophysics as a career or a second degree; your job opportunities would be greatly increased. Although the ratio of degrees earned are ten in geology to one in geophysics, the job opportunities are about equal because oil exploration staffs are approaching a 50-50 mix of these two disciplines.

The recruitment level during 1984 will be depresssed as it was in 1983. Loss of young trained major company staff to small companies has stopped, and many small companies have not survived the recession. Early retirements and staff attrition are expected to remain low for several more years until large numbers of explorationists retire in the late 1980s.

Exploration activity will increase again and must stay strong to replace decreasing domestic reserves and try to maintain the current production level.

Exploration is an exciting business, and a rewarding career in petroleum exploration is available for those of you with talent and perseverance.

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Once again, I welcome the opportunity to participate in this forum.

The mining industry has undergone another year of very difficult times. Consequently, employment opportunities for geologists in the minerals industry are now poor. The United States' economy is currently in a period of recovery. However, most of the rest of the world is not doing nearly as well as we are. Over the past two to three years, decreased industrial activity worldwide has materially reduced demand for mineral products. High inventories caused by the decreased demand have severely depressed prices of most metals. Last year, the price of copper was lower in constant dollars than it had been at any time since 1935.

The net result has been a significant reduction in exploration and mining as compared to the level of three years ago. Many mines have closed, some permanently. Most mining companies have reduced staff, and a few have terminated exploration programs. Many experienced geologists are seeking employment, but this condition is not as bad as it would seem at first blush

So far, I have painted a bleak picture. However, the outlook in the longer term is considerably more optimistic.

The U.S. economy is recovering from the recession. This recovery, which began in December last year, has already regained much of the decline experienced in the recent recession and is expected to continue to grow if inflation is controlled. This improvement is evidenced by increased automobile sales and housing starts. Recovery in the rest of the world is sluggish, but, despite the lag, we anticipate continued improvement worldwide.

In spite of the anticipated substantial growth in the world economy over the next two to five years, the mining industry will be cautious about adding staff in this time frame. There are two principal reasons. First, the recession has materially weakened the financial structure of our industry, and it can't afford the large exploration staffs that existed prior to the mid-1970s. Second, the recession and the cyclical economic swings that are anticipated in the future have caused mining companies to streamline staffs and institute severe cost-cutting measures to weather not only the present but also future recessions. This change is likely to be permanent.

Nevertheless, beginning in 1985, employment opportunities should improve. By improvement, I mean there will be employment opportunities for the better graduates, particularly those with advanced degrees.

Earlier, I mentioned that there are a number of unemployed experienced geologists. One could conclude that these experienced people will provide major competition in the job market for the new graduate. However, the problem is not nearly as bad as it seems. There has been a major shakeout of personnel in the mining industry. As you would expect, those companies that reduced staff did so for the most part by laying off the lower performers. Many, if not most, of the lowest performers will not be able to obtain another job in the mining industry, and they will go into other lines of work. They will not be competing with new

graduates. I believe that as the mining industry recovers from the recent recession there will be rewarding employment opportunities in smaller but more effective organizations.

The key will be the quality of the graduate. Because current projections indicate a surplus of graduates vis-a-vis employment opportunities over the next two to four years, those graduates with poor academic and work records are unlikely to find challenging employment in the mining industry.

If you are in the lower quartile of your graduating class, it may be wise to consider other areas where geologists are needed or to consider changing your major to another professional field.

For those who choose a geology career in the minerals industry, here are a few suggestions to assist you in gaining rewarding employment.

When reviewing academic credentials, the mining industry prefers those students with a strong background in physical sciences, especially physical chemistry. Among geology courses, credits in ore deposits, petrology, petrography, structure, geochemistry, geophysics, and field mapping are considered important, if not essential. Courses in related fields—such as, economics and engineering—are highly desirable.

Trends indicate that an increasing proportion of employment opportunities will be abroad. To qualify for these opportunities, courses in economics, engineering, and political science are considerably more important than for domestic employment. In addition, a second language—preferably Spanish—will provide a decided competitive edge in the job market.

For those students who wish to have careers in minerals exploration and research, graduate-level credits will materially improve employment opportunities. Imaginative and innovative concepts are generated by those who have a broad scientific base. Graduate courses provide the additional breadth and tools to be successful in developing new concepts. Mineral exploration has become so much more sophisticated in recent years that the boundary between exploration and research is increasingly blurred. Thus, graduate level courses applicable to both fields are considered by many companies as almost essential.

The preceding comments apply to suggested courses. Implicit is the need to have good grades. The outstanding student will have a far better chance in competing for the job opportunities that exist.

Students should actively seek summer employment. Apply early—that is, between now and the end of the year. If you wait until January or February, you will probably be too late. Select a summer employer as carefully as you would a permanent employer. If you do get a summer job, work and learn as much as you can. Most companies carefully evaluate their summer students. The best have an inside track for permanent jobs because they are known quantities.

When seeking employment, learn job-hunting skills. Your placement office should have reading materials to help you in preparation of job applications and interviews.

Interviewers will be evaluating not only your academic and employment credentials but also your personal qualities. They will attempt to determine how imaginative and innovative you are and whether you have the initiative to conduct your activities without excessive supervision. For all geologists, evidence of the ability to communicate effectively—both orally and in writing—is essential. Enthu-

siasm is a necessary characteristic that should not be hidden. With increased emphasis on working in teams, your ability to work well with others will be very important. In this regard, the related but broader characteristic, "maturity," is typically evaluated by interviewers.

If you are successful in finding employment in the minerals industry, you can expect starting salaries at about the same level as those of a year ago. Our best intelligence suggests that those with a bachelor's degree may expect $26,000-$28,000 per year, those with a master's $28,000-$31,000, and those with a doctorate $33,000-$35,000.

In conclusion, employment opportunities in the mining industry are currently poor, but they should improve as the economy and the minerals industry recover from the recession. The mining industry will be cautious about adding staff this year and in 1984. However, employment opportunities should materially improve in 1985.

The prospective employer will be looking for the geologist who stands out from the rest of the pack. He will be looking for the man or woman who has a high academic standing, an advanced degree, sound work experience, and who possesses positive personal qualities.

The prospective employer will try to seek this candidate out; however, be aggressive in your job search so that the employer finds YOU.

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The employment outlook in the federal government is really poor right now, but it's not hopeless.

Existing employment for earth scientists in the federal government and current projected vacancies are reviewed in this report, as well as salary levels, qualifications required, specialties needed, some job-hunting suggestions, and finally, some disadvantages and advantages to working for the federal government.

First of all, where do earth scientists work in the federal government?

The federal government employs (full-time) about 2,500 geologists, 2,100 hydrologists, and 500 geophysicists. The Department of Interior is the largest employer of earth scientists—about 1,500 each for geologists and hydrologists, and about 350 geophysicists. Other departments include Army, Agriculture, and Energy, employing between 100 and 300 geologists each. Navy employs about 100 geophysicists, Agriculture employs 300 hydrologists, and Commerce employs 200 hydrologists. Within the Department of the Interior, numbers of full-time geologists are (1982 figures): the Geological Survey, about 1,000; Bureau of Land Management, about 160; and Bureau of Mines, about 100.

The hiring outlook in the federal government in the next couple of years is dim. In the USGS and most other civilian agencies, both budget and staff ceiling reductions exist for fiscal year 1984. The staff ceiling cuts mean that some jobs will not be filled when the current occupant leaves and that some existing temporary appointments cannot be renewed. Projections of vacancies depend mainly on the number of people retiring, and proposed changes in the retirement system could act in opposite ways. Some changes would cause people to leave abruptly, others (such as raising the retirement age) would cause people to stay on whether they wanted to or not. But, overall, there will be very few jobs available. The Geological Survey and the Army are the only ones to even tentatively forecast more than 10 hiring opportunities during the next year—the USGS *may* hire about 30 geologists full time. The number of *temporary and part-time* geologist jobs filled in the Geologic Division of the U.S. Geological Survey from 1979 to 1983 at the bachelor's and master's level is 270, and at the Ph.D. level, 182. During the same period of 1979 to 1983, the number of *permanent full-time* jobs filled at the bachelor's level is 12 and at the Ph.D. level, 84.

Now a few words about the federal hiring process. One of the ways positions are filled is through registers of qualified applicants, maintained by the Office of Personnel Management (OPM). A computerized form may be obtained from any of 70 Federal Job Information Centers. Look in your phone book under U.S. Government—OPM. Send your application to a regional OPM office which runs the register from which people are selected for jobs in that region. Be sure to check whether your application has been entered on the registers; many registers (particularly at bachelor's and master's levels) are full and closed and your application may be discarded by OPM without notifying you.

There are other types of appointments. Professors on sabbatical may have a

faculty appointment. Undergraduate and graduate students may find intermittent employment on student appointments and on a few undergraduate cooperative programs. A whole variety of types of temporary appointments exists. The intergovernmental personnel act provides for temporary assignment of personnel between federal, state, and local governments, including institutions of higher education. The USGS also participates in the National Research Council "Post-doc" program (about 10 jobs available per year), as well as in a summer field cooperative program with the National Association of Geology Teachers (about 50 summer jobs available per year).

Other government-wide summer employment is available through the summer jobs announcements distributed the Job Information Centers in early December. The geologist register closes in early March.

OPM evaluates any application for any job against a Qualification Standard. The geologist standard requires six basic courses (30 semester hours total) in courses covering principles of mineralogy, paleontology, stratigraphy, structural geology, petrology, and geomorphology, plus 20 semester hours in allied sciences, such as math, physics, chemistry, biology, etc. The OPM geologist standard is obsolete; frequent problems occur because course titles and content have changed in the last 20 years! Federal jobs are classified by grade levels (GS rating). A bachelor's degree from an accredited university meeting the above qualifications rates a GS-5, almost $14,000 per year; a master's at GS-9, $21,000; a Ph.D. at GS-12, $30,400. The top salary in the Civil Service has a congressionally mandated cap at $66,000. These salary figures include a 4% raise promised in early 1984.

Promotions within the USGS research category are by peer panel review—a fair process, and, because panel membership rotates continuously, scientists are able to see by participation on a panel what wins a promotion. Personality conflicts, if they exist, can't negatively affect a career.

Standards for hiring women and minorities are the same as for anybody else, but affirmative action goals encourage hiring of qualified women and minorities.

Part-time jobs have increased greatly in the federal government over the last 10 years because of severe limits on full-time allowances. In 1972 the Geologic Division of the USGS had a ratio of nine full-time to one part-time employee; now it's almost one to one during the peak employment season.

What kind of work does the USGS do? We conduct programs in the Geologic Division to assess energy and mineral resources, to identify and predict geologic hazards, and to investigate the effects of climate. These assessments are essential to planning for the wise use and management of the nation's land, mineral, and water resources and to mitigating the disastrous effects of geologic hazards. For instance, the Reactor Hazards Research program has supported fundamental research in regional tectonics, in new age-dating methods, in subsidence by fluid withdrawal, in landslide processes, and in estimating ash fall accumulations from volcanoes—all this for the purpose of finding safe sites for nuclear reactors. New scientific thrusts in the planning stage include studies of a trans-Alaska Crustal Transect, resources of the 200-mile zone offshore, evolution of sedimentary basins, Antarctica, and new ore environments for Mesozoic basins and the mid-continent.

A quick overview of the Geologic Division's budget indicates an overall reduction in actual dollars of about 14% since 1981. Inflation has not been

considered, and so the true effect is larger. Changes in specialty areas within this overall reduction are geologic hazards (volcanoes and earthquakes),-20%; geologic framework (mapping), +6%; mineral resource studies, +20%; energy resource studies, -30%; offshore geologic surveys, -35%.

The Geologic Division of the USGS is now looking for these earth scientists:

- at the bachelor's or master's level:

1. Geologists with demonstrated English language skills for text editors and with field mapping experience for map editors. "People skills," such as tact, diplomacy, and patience, are also required for editing jobs.

2. Limited or temporary assignments on various lab and mapping projects. (A broad academic base is particularly attractive.)

3. A chemist for U-Pb zircon lab work.

- at the Ph.D. level:

1. Two economic geologists with recent Ph.D. and specialty in metals for Anchorage, Alaska.

2. A geologist with broad experience in engineering and computer sciences, preferably with experience in utilizing remote sensing and digital image processing for astrogeologic studies.

3. Structural geologist for seismic interpretation.

4. A field-oriented sedimentologist to relate modern processes to stratigraphic sections.

5. A petroleum geologist with experience in basin analysis and structure.

In 1982 and 1983, some significant changes occurred within the Geological Survey. In early 1982, Secretary Watt removed from the USGS the Conservation Division which evaluated natural resources on federal lands onshore and offshore and collected royalties from their development and set it up as an independent unit, the Minerals Management Service (MMS). In early 1983, the onshore resource evaluation function was transferred from the new unit to the Bureau of Land Management (BLM). Consolidation of these functions in both MMS and BLM is underway and therefore the employment outlook is uncertain.

Suggestions about interviews and how to find out about jobs available are offered. Talk to the USGS people at professional society meetings. Find out who the branch chief is in your specialty and call or write him/her. Make your interest known through faculty members. Be prepared to discuss your favorite areas of geology. Be able to say what kind of work you'd like to do. Show scientific breadth and depth and a real interest in going beyond your thesis topic. Show capability to conduct independent research, to recognize problems, to find solutions, and to write well. Know about the agency you're applying to. Read its year book; know its programs and its funding. Read the summary of research that is conducted by that agency each year. Above all, be able to answer the question, "Where do you see yourself professionally 10 years hence?"

With regard to written applications, it's obvious, but *be legible, be literate, be sure you don't use blue ink* (because it will not copy); *use black ink*. Be sure that the statements of your past work experience are clear and show the level of responsibility you have had, evidence that you meet deadlines, and that you work well on a team. One-page resumes are not very helpful. Send transcripts or course lists with grades and standard form 171 to me or to the appropriate branch chief.

As far as disadvantages of federal employment are concerned, the salary is less than in industry, the raises don't keep up with inflation, the conflict of interest regulations mean owning no stock in oil or mining companies and no consulting, and sometimes there is a little red tape.

The advantages. First, last, and always is the freedom to pursue and publish scientific ideas; then the knowledge that you are gathering and interpreting data objectively on critical national problems; an atmosphere where you work in colleagial interaction with scientists in all disciplines, where you have good facilities and equipment and encouragement for professional growth (especially participation in societies like GSA); and a relative geographic stability.

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In 1983 employment opportunities with state and local governments decreased in response to the general slow down in the economy, budget proration, and personnel hiring freezes. In recent years, programs and responsibilities have increased, and, with a return to a better economic environment, employment opportunities should improve. Geological employment with state government is primarily with the state geological survey which is a service and research organization whose programs are heavily slanted toward the application of geology for the development and conservation of the state's resources and toward assisting industry and citizens with geology-related problems. During the past decade other major employment areas for the geoscientists have developed or expanded in state government, especially in environmental agencies, mining commission, and public health agencies.

Most state employment is with real-world governmental agencies often involved with political problems, usually underfinanced, understaffed, and generally marginally equipped to do the job. Job opportunities vary from state to state. Many geological surveys are moderately sized agencies with staffs of up to fifty geoscientists, and few have more than a hundred staff geoscientists. The size of geologic staffs with other agencies may range from one or two to more than 200 geoscience trained people. As with any business, job openings continue to occur in state government as existing staff retires or resigns, or as changes in the basic program of the individual agency occur. Over the past decade, most state surveys experienced moderate professional staff growth in response to program initiatives to study the depletion of our natural resources and the quality of our environment. Similar growth was noted in agencies involved with environmental protection. Current funding levels have been impacted by a slowdown in the overall economy, and employment opportunities lessened. However, the forecast is that many surveys and other state agencies will add to their staffs in the next five years.

Program

Major program areas for state geological surveys in 1983-84 continue to be

Mineral Resources Studies (including industrial mineral and base metal assessment),

Energy Resources Studies (including peat, lignite, coal, oil and gas, geothermal assessment),

Geologic Framework Studies (including geologic mapping, subsurface geology),

Water Resources Studies (including ground water and water quality),

Applied Geology (including hazardous and toxic wastes investigations, environmental studies, engineering geology), and

General Service (including computer applications and information dissemination).

Employment

The approximate number of geologists currently employed by state govern-

ments is unknown because many job titles do not reflect the geoscience background required. As of the first of July 1983, state geological surveys employed 1,229 full-time and approximately 157 part-time geoscientists. Of that total, 139 women were employed full time and 46, part time. Identified ethnic minorities numbered 14. Total professional geoscience employment with state surveys was 1,386.

Staff enlargement by any state agency is dependent upon funds, either state appropriations or federal money. Recent national budget changes have impacted the individual state programs, often resulting in major programmatic changes at the state level. Such change often creates challenging opportunities for new employees.

As of October 1983, there are approximately 40 job openings available with state surveys, down about 43% from 1982. However, at least 100 job openings are anticipated by June 1984 if economic conditions improve.

Current areas for employment, in order of need, are (1) general earth scientist, (2) coal geology, (3) minerals, (4) hydrology, and (5) stratigraphy.

Job openings by professional interest in 1983-84 include:

Economic geologist (metals and industrial minerals)
Coal geologist
Petroleum geologist (oil and gas)
Groundwater geologist
Stratigrapher
Geochemist (organic and inorganic)
Structural geologist
Director, research/program director
Engineering geologist
Mining geologist
Environmental geologist
Cartographer

Opportunities for women geoscientists are becoming more available, especially to fill positions in hydrogeology, stratigraphy (surface and subsurface), oil and gas, and field mapping.

Part-time and summer employment is usually available with state surveys, but positions are very competitive. However, the experience gained through these positions is often well worth the effort to secure a position. Most state geologists indicated that they would consider applications throughout the year for office assignments, but they emphasized that openings for field work were more common in the summer and thus application for these positions should be submitted during the earlier part of the calendar year. If you think you would like employment at a state survey, go by for a visit, see what people do, the projects that are currently active, and especially make yourself known to those people in the discipline area in which you think you might enjoy working.

Besides state geological surveys, geology and geology-related jobs exist in other state and local agencies. Typical of these job opportunities are openings with

Highway Departments
Environmental Protection Agencies
Natural Resources or Conservation Departments
Strip Mine Reclamation Commissions
Water Development Boards
Public Health Departments
Oil and Gas Boards
Planning and Development Offices
Departments of Mines

The job titles in these agencies may not imply geologic training, and thus a careful analysis of the general job descriptions should be made.

Job opportunities for geologically trained people are also becoming more common with city and county governments. However, these jobs are rarely

advertised openly and must be obtained through personal liaison and demonstrated ability to do the job. Currently, most jobs are with city planning departments and zoning commissions or health organizations. Salaries are generally comparable to state pay scales.

Pay Scale

Entry salaries for most state government jobs for new and recent geology graduates are keyed to advanced-degree people. Many state geologists have indicated they will no longer consider professional appointments for individuals with less than a master's degree. Average annual salary ranges nationwide for state-employed geologists are

Degree	Salary Range
BS	$16,700–$24,800
MS	19,400– 30,600
Ph.D.	23,800– 36,400

Entry salaries have tended to drift lower during the past 18 months in response to the slower economic picture. However, most state entry salaries are currently marginally competitive and do have built-in promotion adjustments. Also, previous experience, part time or full time, could increase your entry salary as much as 35%.

Qualifications

Increases in job entry requirements are related to recognized deficiencies in academic training. Over the past few years, undergraduate curriculum has strengthened the recent graduates' basic concepts, but several course areas are still less than adequately covered. State geologists emphasize a strong academic background knowledge of field geology, structural geology, petrology and petrography, stratigraphy, and geohydrology.

Nongeologic courses considered important for every prospective employee include physical sciences (either chemistry or physics), English composition, economics or computer science, and report writing and calculus.

Personal qualities are assessed as an important part of your qualifications. Each state geologist attempts to find or ascertain each applicant's ability (1) to communicate and express ideas, (2) to do independent research and to perform routine services, (3) to meet the public, (4) to seek out reference sources, and (5) to start and complete a project.

Hiring Policies

Employment with state government is generally controlled by Civil Service procedures that vary from state to state and require the evaluation of the individual's previous experience and education. Many states advertise nationwide in trade journals and participate in employment bureaus such as GSA Employment Service. From application review to employment may take from four to six months. Year-round recruitment is practiced by most state agencies.

Advancement rate and opportunity differ between the individual state agencies and between different states and is dependent on the respective state personnel systems. Most state agencies have organizational structures permitting advance-

ment commensurate with ability and productivity. Yearly pay increases are generally given, and, in addition, cost of living adjustments ranging from 5 to 25 percent have been common in recent years or are currently pending.

Summary

ADVANTAGES of state government employment are (1) work diversity; (2) involvement in the decision-making process; (3) credibility as a professional; (4) a sense of accomplishment inasmuch as the work is implemented immediately for the benefit of the public, and in the saving of tax dollars and lives; (5) pleasant working conditions and a restricted area of travel; and (6) reasonable job security and an opportunity to settle in one area and provide a reasonable quality of life for your family.

The DISADVANTAGES are (1) low pay; (2) long hours; (3) fringe benefits that are sometimes low compared to industry; (4) often you are in a sensitive job where the responses are demanded overnight; and (5) above all, there can be job frustration—often due to the lack of time or money to complete a job to your own personal satisfaction.

In conclusion, the work of geologists in state and local government (1) offers the opportunity to pursue individual research interests, (2) offers the opportunity to develop a sense of professionalism, (3) provides opportunities for personal and professional advancement, and (4) provides a challenging opportunity for personal accomplishments.

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Employment opportunities in most academic disciplines are going to be restricted for the next 10 years due to a sharp decrease (25%) in the young adult population. Although most colleges and universities have special programs to attract "new market" students, these efforts have failed to offset the impact of enrollment decline in traditional-age college students. Academic employment is further restricted by the large number of faculty hired during the baby boom build-up of the 1960s and 1970s. These tenured faculty members are 10 to 25 years from retirement. In addition, reduced state and federal funding, fluctuations in endowment income, and rising costs and tuitions are influencing the academic market place in a negative way. As a result, The Center for Study of Higher Education predicts 200 colleges in the U.S. will close during the 1980s. These unfavorable conditions will be most severe in the Northeast and Midwest, and may be minimal in some parts of the Sunbelt and the West.

According to the National Science Foundation, the general outlook for academic employment has not affected the physical sciences in the U.S. as yet. For the past 8 years, faculties grew at a nearly constant 2% per year. Most of the new employment was in the 100 largest Ph.D.-granting institutions. A trend toward differential opportunities for women in response to affirmative action programs is also evident, but the overall percentage of women employed full time is still below 10%.

Prospects for teaching careers in the geological sciences are better than in many other disciplines in the physical sciences. In selected fields (i.e., geophysics, hydrogeology, and petroleum geology), there are few qualified applicants for existing vacancies. The favored status for the earth sciences resulted from a combination of factors related to increased employment opportunities at high salaries in the petroleum industry from 1979 to 1981. This caused a dramatic rise in undergraduate and M.S. graduate-level enrollments. At present, enrollments in the earth sciences are at an all-time high with 47,301 enrolled at all levels during 1982-1983. This is a gain of 6.4% over the previous year. However, the dramatic fall-off in petroleum employment will result in declining enrollments.

During the period 1979-1981, exceptional job opportunities for M.S. students and increasing educational costs caused a modest decrease (about 2% per year) in Ph.D. enrollments. More important, industry was attractive to many graduating Ph.D.s. These factors lessened the competition for academic positions. However, the lack of opportunities for industrial employment at present has reversed this trend, and Ph.D. enrollment was up 6.4% for 1982-1983.

In recent years, an increasing number of academic vacancies in the geological sciences became available through faculty resignations and early retirements. Although reduced support for teaching and research programs is partially responsible, a sharp decline in the purchasing power of professorial salaries (about 20% since 1976) is the primary cause.

According to the Scientific Manpower Commission, the salaries of geoscientists grew more than 200% during the period 1973-1981. This exceeded the rise in the consumer price index by more than 107%. However, academic salaries during this period fell far below the rate of inflation. In spite of the negative aspects of this continuing condition, it does serve to increase opportunities for those interested in academic careers. However, with sharply curtailed opportunities for industrial employment, fewer faculty resignations are anticipated.

The upward trend in academic employment opportunities during the period 1980-1982, as documented by a systematic increase in college-level positions advertised in *Geotimes* and registered with the GSA Employment Service, was reversed in the fall of 1982. This downward trend continued for 1983. *Geotimes* advertisements decreased about 30% from 1981, while academic employers utilizing the GSA Employment Service declined about 60%. Most of the advertised positions were tenure-track appointments at the Assistant Professor level. However, it is anticipated that this type of appointment will decline as faculty unionization increases. It is predicted that fixed-term appointments with a renewal clause based on a review of qualifications will increase in the future.

With all the conditions described above at work, one can anticipate modest opportunities for academic employment. The situation will not brighten until there is a significant upturn in industrial and governmental employment. Existing opportunities will be better for minorities and women. In all instances, a diligent search will be necessary, and one may need to wait a year or two to find a tenure-track position. It also may not be at that ideally located, prestigious institution with ample research opportunities, adequate support staff, and light teaching loads.

Despite numerous problems affecting employment at the secondary level, the demand for earth science teachers is still relatively high in selected geographic areas. In addition, a few positions involving aspects of education are available with some federal organizations, state and county parks, and museums. However, these types of openings are usually hard to locate, and the salaries are often low.

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I. NATURE OF CONSULTING FIRMS

Geoscience consulting firms provide services to oil, gas, and mining industries; local, state, and federal governments; utility companies; developers—just about any sector of the society that seeks assistance in evaluation of geologic, soil, seismologic, geophysical, and hydrologic conditions. Other types of consulting firms, commonly called Architectural and Engineering (A & E), provide services in design and construction. Additional consulting services are in evaluation of environmental impacts from planned construction of major projects.

Because consulting firms are so tied into both the public and private sectors, they are affected immediately by the ups and downs of the economy and the changing world market. What this means is that:

1. Consultants must be aware of the changing market and where the real needs for their services are (e.g., a few years ago, there was a great demand for capabilities in dams and nuclear power plants; *now*, emphasis is in hazardous waste disposal and control).
2. Employees of consulting firms must have the diversity of skills and flexibility to meet changing needs in the market. This requires constant continuing education.

In short, geoscience consultants sell a service—their technical skills, which are applied directly to their client's problems. My emphasis here is on the geoscience consulting firms.

II. CAPABILITIES SOUGHT IN APPLICANTS

Technical

As described by the speakers before me, to be successful in a geosciences career requires that you have a strong technical base. What geoscience consulting firms seek are:

- *for the undergraduate*—a strong background in an earth science, or civil engineering, mathematics, or chemistry. In addition, it is wise to gain insight through belonging to university organizations associated with your discipline and to participate in as many field trips, seminars, and workshops as would expose you to the diversity of the discipline. If at all possible, seek a variety of summer working experiences. Of special importance is a knowledge of field techniques (drilling, pumping tests, logging, water-quality monitoring, or geophysical applications). In addition, one should become proficient in stratigraphic procedures such as rock and soil logging and description. Useful courses include stratigraphy, structural geology, sedimentation, economic geology, hydrogeology, geochemistry, geophysics, and Pleistocene geomorphology.
- *for the master's student*, the same credentials are sought as for the bachelor's candidates, with particular interest in direct application of their course work—practical field experience. Employers also look for diversity, e.g.,

economics, law, policy courses. Some expertise in computer applications and/or statistics is almost a basic requirement. Above all, during an M.S. program, a student must take courses outside of those offered in the average geology department.

- *Ph.D. candidates* are sought for their specialization to meet the anticipated or on-going market demands. Here a balance of theoretical background and experience in application of skills to contemporary problems is sought.

In summary, we seek (at all levels):

- strong technical education—a serious student who is interested in his or her science and is knowledgeable about the nature of a consulting firm and what he or she can contribute to that firm.
- actual field experience—application of theory to real-life, problem situations.

Nontechnical

1. *Strong writing skills*—The product of consulting is not a dug trench or an observation well or a seismographic array. The client sees a report. We sell our services through technical proposals. We are professionals who write and, therefore, we are professional writers.

   I encourage all employment-seekers to constantly work at improving their writing skills,to learn to organize their data and thoughts, and to learn how to be succinct and direct in their messages. Consulting firms cannot afford poorly written material that has to be revised. Too many revisions or too long a text result in high production costs. Also, if you cannot express yourself in writing, it affects your chances for advancement.
2. *Business awareness*—Consulting firms survive on the business development capabilities of its staff. The higher you go within a company, the more you are expected to identify markets and to secure projects. Therefore, when seeking work in a consulting firm, and if anticipating advancement, you must have a combination of strong technical and writing skills plus a business sense (i.e., a willingness to know what geoscience services are needed to sell the firm's [and your] capabilities).
3. *Project management skills*—Because you have technical skills does not mean you are a natural project manager. This capability comes through experience, observation, and often, company style.

   What is involved are skills in budget control, an ability to keep on schedule, an ability to communicate positive and negative aspects of the project with a nontechnical client, an ability to work with all varieties of professionals, technicians, and support staff. You must also be a stern disciplinarian and be able to command respect and action out of your staff.

   Whether you are a bachelor's degree candidate or 15-year professional, these skills can be continually developed and refined. Be aware of the need for them and the fact that you can always improve.

III. PROS AND CONS OF WORKING FOR A CONSULTING FIRM

A. Contrary to popular belief, salaries in consulting firms are usually in the middle range—not as high as the oil companies, but generally higher than in the academic world.

B.S. degree: $18,000-$23,000 (depending on experience. If 15 years experience, may be $45,000 or higher)

M.S. degree: $23,000-$32,000 and up (again, the years of experience dictate)

Ph.D. degree: $28,000-no limit (especially if one's expertise is in a limited field and of extreme value for a new, developing market)

Benefits vary from company to company—medical, dental, life insurance, profit sharing, and bonuses.

B. Staff advance (or fail) rapidly because of the demands for quick, professional decisions and continual challenges equal to or beyond their training.

C. Most assignments require staff be at the leading edge of technology.

D. Overall situation involves long hours and travel, mixed with times of inactivity or no assignments.

E. Very important is the personal challenge—you are always on a learning curve.

IV. PRESENT TRENDS

The latter half of 1983 has seen a increase in hiring. In fact, many firms have reversed trends in large layoffs. To do this, many firms have reorganized and/or combined offices in the attempt to address new markets or to cope with (1) the decline in electrical power plant construction, mining, oil shale development; (2) easing of enforcement of hazardous waste monitoring; or (3) the slack in the construction business.

All these directly affect an applicant's chances for success. My advice is to research the firm you are interested in. Try to understand the focus (or intended focus) of their services and if your skills are of value to them in that market. And apply. Don't stop with just submitting a letter and resume. Continue to show interest and awareness of their needs and circumstances. And stick with it.

A final note. Remember to look to the future during your education. Don't prepare yourself for a static market condition.

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Resumes and interviews

All of you job-seekers in the audience today have four significant challenges in common:

1. What is out there for me (employer identification)?
2. How do I gain the attention of an employer (the resume process)?
3. How do I determine the interest of an employer (the interview process)?
4. How do I maintain and foster the interest of an employer (the follow-up process)?

Most of you will gain the attention of an employer only through submission of a resume. Because of this and because the average geosciences employer is continually receiving both solicited and unsolicited resumes, your presentation must be unique, but within limits.

Resumes themselves come in all sizes, lengths, degrees of clarity, and usefulness. The purpose of my comments is to help you to mold your resume style and content to a format that should survive the first 60 seconds in an employer's hands. That is about the average life span of an unworthy resume.

The person who is responsible for reviewing job applications in a given firm has individual and predetermined indicators, or index properties, that are going to say "throw," or "read thoroughly," or "set aside to read later."

Some all-too-common limitations of resumes and cover letters are discussed.

Cover Letter:

- Sometimes missing altogether.
- Illegible because it is hand-written.
- Unsigned (an automatic "throw").
- Computer generated, indicating a shotgun approach to application. (If you're not interested enough to send a separate letter, a firm usually isn't interested in you.)
- Has misspelled words and typos. (This is especially poor if the name of the person addressed, or the firm name, is misspelled. Indicates sloppiness on part of applicant.)

Resume Proper

- Contains gaps in the chronological record, e.g. does not account for the last six months of your life. What did you do?
- Stresses trivia over useful information. The employer wants to know primarily what you can do professionally, what you have done professionally, and what specific interests you have. Of less importance is information on nonprofessional activities.
- Has missing references. Don't say "references supplied upon request" or "references can be sent for." If you are a serious applicant, you do the work. Line up references in advance. Get their approval to be listed, and then list them. Above all, make sure your reference is willing to promote you.

- Is disorganized. Frequently a resume has no specific categorization. It does not contain *the most significant information up front. The reader* has to search several pages to piece together a chronological story.

Recommended Organization of Resume

- Personal data (address, phone number).
- Educational summary.
- Professional experience summary (in chronological order).
- Special interests and abilities.
- Awards, honors, special recognition (especially if tied to professional activities).
- References.
- Publications (list them; don't say "send for publication list").

Recommended Presentation

- A well-conceived, succinct cover letter. Be formal, not folksy.
- Duplicate your resume—but never a cover letter.
- Use good quality paper (not the back of a lab assignment sheet) for the resume.
- Type or print the resume; do not offer a hand-written test.

Other Concerns

- Be sure, if you are responding to an advertisement, that you meet the minimum qualifications for the job. If the ad says "M.S. degree plus 5 years experience," don't apply if you have the M.S. plus less than 5 years experience. Federal/State regulations require an employer to acknowledge only those candidates who meet qualifications advertised. An employer must readvertise a position if qualifications change.
- Be sure to meet the deadline of an advertisement. Again, regulations prohibit an employer from accepting late applications.
- Be sure you are really interested in a job before applying. The employer assumes you are a valid candidate. Do not apply for a job as a means of leveraging yourself into a better position within your present firm (if already employed). You just might survive the initial round and be invited to an interview, often at great expense to an employer.
- Note in the resume or cover letter any special restrictions on travel (e.g., if your family situation makes it difficult to accept long, out-of-town assignments, say so).

The Interview

Some simple, logical procedures on your part should be practiced:

- Be on time.
- Be courteous.
- Be responsive. Be willing to talk *and* listen. Don't ramble. Don't prolong an interview. The employer should be in control of the interview, not you.
- Be concise in your responses. If answer A is requested, don't give A plus B plus C.
- Very important—show a knowlege of the firm. This requires you to do homework. Ask questions or give responses that let the interviewer know you are familiar with his/her firm.
- Discuss your special talents, but only if these talents relate to the job.

- Think before you answer. If a question seems vague, ask the interviewer to restate the issue.
- If a meal is part of the amenities before, during, or after an in-office interview, do not assume you are off duty. The whole process from your first to last exposure with the interviewer is part of the interview in the mind of the employer. Therefore, forget your favorite jokes or other nonprofessional behavior. It's okay to relax, but do so with class.
- Don't take along your friend or spouse to the interview. When someone is waiting for you, the interview frequently suffers.
- Request to know when some decision will be forthcoming.
- Give a firm handshake.

Follow-up

For your own curiosity and to show an employer continued interest, it is wise to:

- Write a thank-you note in which you offer another piece of information, or clarify some issue.
- Allow the time stated for a decision to pass by only a few days. If no word, call.
- Do not pester. Call once; thereafter, adhere to the employer's time frame.

The main factor in job seeking is to behave as a professional. Assume there's just the right job out there somewhere—then go for it.

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Please rush the information checked below to me at the address provided and/or change my address as noted.

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_____ GSA's current Publications Catalog

_____ DNAG (The Decade of North American Geology) — GSA's Centennial project, a new synthesis of the geology of North America, resulting in a series of books and maps to be published during the next several years

_____ The GSA Foundation, a separate organization established for the purpose of receiving gifts and endowments for the support of the DNAG project and/or other Society goals in the earth sciences

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